8.5.2   *Protected Tree Species*

According the Act (National Forests Act (Act no 84 of 1998)), the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister.

No tree species that are currently included in the National Forests Act is present within the study area.

8.6   ALIEN & INVASIVE PLANT SPECIES

The following invasive and weed species were noted on the study site (refer Table 6). Some of these species occur at densities that approximate a dominant status. The generally degraded nature of most of the site is indicated by the presence of these species, dominant species in particular.

Table 1: Invasive and weed plant species recorded in the study area			
Species Name	**Growth Form**	**Family**	**Status/ Uses**
Amaranthus hybridus	Forb	Amaranthaceae	Edible parts
Bidens formosa	Forb	Asteraceae	Weed, exotic (S. America), aesthetic uses
Cirsium vulgare	Forb	Asteraceae	Declared Invader - Category 1, weed
Conyza bonariensis	Forb	Asteraceae	Weed, indicator of disturbed areas
Crepis hypochoeridea	Forb	Asteraceae	Weed, indicator of disturbed areas
Cynodon dactylon	Grass	Poaceae	Indicator of disturbed areas, grazing potential
Datura stramonium	Forb	Solanaceae	Declared Invader - Category 1, weed
Eucalyptus species	Tree	Myrsinaceae	Declared Invader - Category 2, essential oils
Galinsoga parviflora	Forb	Asteraceae	Weed
Gomphocarpus fruticosus	Shrub	Asclepiadaceae	Medicinal uses
Hypochaeris radicata	Forb	Asteraceae	Weed
Lactuca capensis	Forb	Asteraceae	Weed
Pennisetum clandestinum	Grass	Poaceae	Invader (E. Africa), palatable grazing
Pentarrhinum insipidum	Climber	Asclepiadaceae	Edible parts
Pseudognaphalium luteo-	Forb	Asteraceae	Weed (Europe)
Richardia brasiliensis	Forb	Rubiaceae	Weed
Schkuhria pinnata	Forb	Asteraceae	Medicinal uses, weed (S. America)
Sonchus oleraceus	Forb	Asteraceae	Edible parts
Sonchus wilmsii	Forb	Asteraceae	Weed
Stoebe vulgaris	Shrub	Asteraceae	Invasive properties
Tagetes minuta	Forb	Asteraceae	Essential oils, colours & dyes
Verbena bonariensis	Forb	Verbenaceae	Weed (S. America)
Verbena brasiliensis	Forb	Verbenaceae	Weed (S. America)
Xanthium strumarium	Shrub	Asteraceae	Category 1, weed (S. America)

Due to the relative high levels of transformation as well as low utilisation levels and the effect of frequent burning noted across most of the site, vegetation within the study area was found to be relatively degraded. Because of intensive human activities, remaining natural vegetation within the study area is not regarded representative of the regional vegetation type, i.e. pristine. Results of the photo analysis and site investigations revealed the presence of the following habitat types (refer Figure 6):

•   Agricultural Fields (171.6ha, 49.7%);
•   Excavations (11.9ha, 3.4%);
•   Exotic Trees (5.4ha, 1.6%);
•   Grassland (33.6ha, 9.7%);
•   Moist Grassland (13.0ha, 3.8%);
•   Rehabilitated Land (31.1ha, 9.0%);
•   Roads & Railways (36.1ha, 10.5%);
•   Transformed Habitat (11.8ha, 3.4%);
•   Unrehabilitated Land (4.9ha, 1.4%) and;
•   Wetland Habitat (26.1ha, 7.6%).

8.7.1   Agricultural Fields

Cultivation represents the major land transformation activity in the region, resulting in a mosaical pattern of agricultural fields within a natural grassland environment. These areas comprise lands that are either currently actively cultivated for crops, or fallow fields where agricultural activities has ceased some time ago, but the vegetation still reflects the impact of transformation. Fallow fields are characterised by a composition of weeds and pioneer species, representing early successional stages of vegetation. These species will continuously be replaced by species that are better adapted to changing environmental conditions. Ultimately, a new climax status will be achieved, but the species composition and physiognomy will not be similar to the original status.

Species that indicate the poor habitat status of this habitat type include *Bidens formosa, Chloris virgata, Cirsium vulgare, Crepis hypochoeridea, Cynodon dactylon, Galinsoga parviflora, Pennisetum clandestinum, Plantago longissima* and *Tagetes minuta.* The absence of species that are normally associated with pristine regional grasslands is absent, or occurs at extremely low cover abundance levels. The original grassland vegetation in these parts is entirely compromised and is unlikely to recover to a status that approximates the original status. A low floristic status is consequently ascribed to these areas. No Red Data plant species were recorded within these areas. The likelihood of encountering Red Data plant species within these areas are regarded low because of habitat transformation.

8.7.2   *Excavations*

Excavations represent areas where significant surface disturbances resulted from the removal of all vegetation and part of the topsoil in the area. Since these areas are mostly devoid of any vegetation, a low floristic sensitivity was ascribed to all representative areas.

8.7.3   *Exotic Trees*

Small stands of exotic trees occur in the study area, the most significant being associated with the homestead that is situated in close vicinity to one of the proposed power line alignments. This habitat type comprises all areas where natural vegetation has been replaced by stands of exotic trees, mostly *Eucalyptus* species. A low floristic status is ascribed to these areas and it is regarded highly unlikely that these areas will be inhabited by any Red Data flora species.

8.7.4   *Grassland*

The natural grassland of the study areas are characterised by a short, low cover of herbaceous species, physiognomically dominated by grasses. The floristic status of these areas is largely determined by the intensity of grazing by cattle and sheep and by the intensity and frequency of burning. In areas where high grazing pressure predominate the vegetation is dominated by the grasses *Eragrostis plana, E. chloromelas, Cynodon dactylon* and the forbs *Cirsium vulgare* and *Crepis hypochoeridea.*   The species diversity in these parts is frequently low.   No area of particularly pristine status was observed within the study area. Other species that co-dominate the vegetation of this habitat type include *Chamaecrista comosa, Digitaria eriantha, Eragrostis, chloromelas, E. plana, Gazania krebsiana, Helichrysum rugulosum, Hyparrhenia hirta, Richardia brasiliensis, Scabiosa columbaria, Senecio erubescens, S. inaequidens* and *Verbena bonariensis.*

A medium floristic status is attributed to this variation, mainly because of the poor floristic status of remaining areas of natural grassland. It should be noted that the Endangered status of the regional vegetation type was also taken into consideration in this estimation. No Red Data plant species were recorded within these areas. The likelihood of encountering Red Data plant species within these areas are regarded low because of poor habitat status.

8.7.5   *Moist Grassland*

Small parts of the study area comprises grassland that occur in-between terrestrial and aquatic systems, usually situated on terrain type 4 (footslopes) in close vicinity to valley bottoms (drainage lines, streams, rivers, pans). This vegetation type is generally termed 'Hydromorphic Grasslands'. Soil conditions indicate temporary inundation during times of high rain, but are generally dry for the longest part of the year. Since this community occur in close vicinity to wetland habitat systems, they are generally regarded as sensitive, but a poor floristic status that is observed generally resulted in a medium-low sensitivity ascribed to these parts. Only in one

case was a relative pristine status noted and a medium high status and sensitivity was ascribed. Soils are frequently high in clay content and the vegetation is therefore highly palatable; a high grazing factor subsequently contributes to the moderately degraded status or some parts.

A relative low floristic diversity is noted in these parts. The physiognomy is grassland with a well-developed and dense herbaceous layer. Moist conditions are indicated by the presence of flora species that are well adapted to moist conditions, including *Cyperus* species, *Denekia capensis, Eragrostis gummiflua, Homeria pallida, Imperata cylindrica, Lobelia* species, *Scirpus burkei, Senecio erubescens* and *Verbena brasiliensis.*

The poor floristic status of portions of this unit is indicated by the (extensive) presence of the following weeds, *Amaranthus hybridus, Bidens formosa, Crepis hypochoeridea, Hyparrhenia tamba, Paspalum dilatatum* and in particular the grass *Pennisetum clandestinum.* **[1]**Depending on the level of degradation that is noted within portions of this habitat, the floristic sensitivity varies between medium-high and medium-low.

8.7.6 Rehabilitated Land

A portion of the property constitutes an area where previous surface disturbances were rehabilitated (presumed) and some flora species were sown in. The surface soil conditions indicate the presence of stone granules that are more commonly associated with lower soil horizons. In addition, some parts are present where surface restructuring is incomplete and remaining topsoil is present. In spite of the rehabilitated status, the vegetation was found to be relatively diverse, albeit not representative of the regional vegetation. It would appear as if these areas are not grazed and the vegetation is afforded chance to develop constantly. Further evidence of the rehabilitated status of the vegetation is the relative low basal cover of these parts.

Species that abound in this area include *Chamaecrista comosa, Bidens formosa, Cirsium vulgare, Conyza bonariensis, Crepis hypochoeridea, Cynodon dactylon, Digitaria eriantha, Eragrostis chloromelas, E. curvula, E. plana, Gazania krebsiana, Gnidia microcephala, Gomphocarpus fruticosus, Helichrysum argyrosphaerum, H. caespititium, H. rugulosum, Hyparrhenia hirta, H. tamba, Indigofera* species, *Nemesia fruticans, Oldenlandia herbacea, Richardia brasiliensis, Schkuhria pinnata, Tagetes minuta, Tephrosia species* and *Zornia linearis.*

A medium-low floristic status is ascribed to this habitat type because of previous degradation. It is unlikely that this habitat is suitable for any flora species of conservation importance.

8.7.7 Roads & Railways

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[1] Due to the variance in status of this habitat type, the sensitivity analysis will reflect 2 separate calculations for the Moist Grassland habitat type (MG Units 1 & 2)
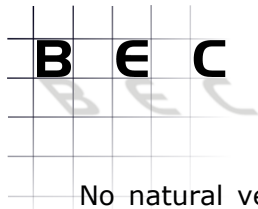
No natural vegetation is associated with these features and a low floristic status is ascribed to these parts of the study area.

8.7.8   *Transformed Habitat*

This habitat type represents areas where historical or recent human activities led to transformation of the natural vegetation. No natural vegetation remains in these areas and the floristic status of these areas is therefore regarded low because of the secondary vegetation that characterises this community. The likelihood of encountering Red Data species within these areas are regarded low.

8.7.9   *Unrehabilitated Land*

This portion of land is situated within close proximity to the Rehabilitated portion of land. Evidence of surface disturbances is still evident and the bare nature to the soil indicates that no revegetation activities have been undertaken. No natural vegetation remains in this area and the floristic status is regarded low because of the secondary vegetation that characterises this community. The likelihood of encountering Red Data species within these areas are therefore regarded low.

8.7.10   *Wetland Habitat*

This habitat type correspond to the endorheic pans that are present within the study area where soils are inundated or standing water are present for extensive parts of the year. In spite of rain that occurred prior to the site investigation, no water was present within these parts at the time, but soils were moist. Vegetation of these parts has not had chance to develop and the poor floristic diversity that was noted during the survey is likely an indication of the seasonality and not a true reflection of the status of these areas.

The floristic status of these areas is generally regarded medium-high and few impacts other than grazing and trampling, which are significant impacts on their own, were noted. Impacts on this habitat type include trampling of the topsoil by cattle, peripheral infestation by terrestrial species that abound in agricultural fields, cultivation and roads and other linear developments.

In a pristine status, these areas would be dominated by a dense grass layer and diverse herbaceous composition. The vegetation composition is likely to be dominated by hydrophilic species or grass and forb species that are adapted to permanent or temporary inundation with water. Soils in these areas are frequently high in clay content and a significant humic layer is present. The vegetation that characterise these parts are therefore highly palatable and normally targeted by cattle, resulting in frequent degradation.

In a pristine condition, the grass *Leersia hexandra* is likely to dominate, with *Helictotrichon turgidulum, Paspalum* species*, Juncus oxycarpus* and *Kyllinga pulchella*. Forbs, herbs and bulbs

are normally not abundant, but those that frequently do occur in this type of habitat include *Persicaria attenuata, Verbena bonariensis, Cycnium tubulosum, Lobelia erinus, Helichrysum rugulosum* and *H. coriaceum.* Species that were recorded during this assessment include *Berula erecta, Cyperus* species, *Denekia capensis, Homeria pallida, Imperata cylindrica, Leersia hexandra, Lobelia* species, *Oxalis* species, *Paspalum dilatatum, Rumex* species, *Senecio achilleifolius, S. erubescens, Typha capensis, Phragmites australis* and *Persicaria* species.

Many of the pans in the region are in relatively good condition, despite existing impacts of agriculture. This habitat type is therefore ascribed a medium-high floristic status and, because several flora species of conservation importance are likely to occur within these areas, a high floristic sensitivity resulted for the following reasons:
- they perform an important ecological function, e.g. maintaining water purity and supply and reducing soil erosion;
- they provide habitats for various wild animal and bird populations and contain many plant species that are restricted to this habitat;
- they have been transformed or are under threat by various factors in many parts of the country; and
- Red or Orange List plant species that could potentially occur within this vegetation unit include *Crinum bulbispermum* (Declining), *Nerine gracilis* (Near Threatened) and *Kniphofia typhoides* (Near Threatened).

[2]Parts of the study area also comprises wetland habitat that developed from the accumulation of runoff water from infrastructure, impounded alongside the road in the southern part of the study area. The vegetation of this part comprises mostly flora species that indicate poor habitat conditions. A medium-low status is ascribed to these parts and it is regarded unlikely that flora species of conservation importance will occur within these areas.

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[2] Due to the variance in status of this habitat type, the sensitivity analysis will reflect separate calculations for the Wetland habitat type (WL Units 1 – 3)

Figure 1: Floristic habitat types of the study area
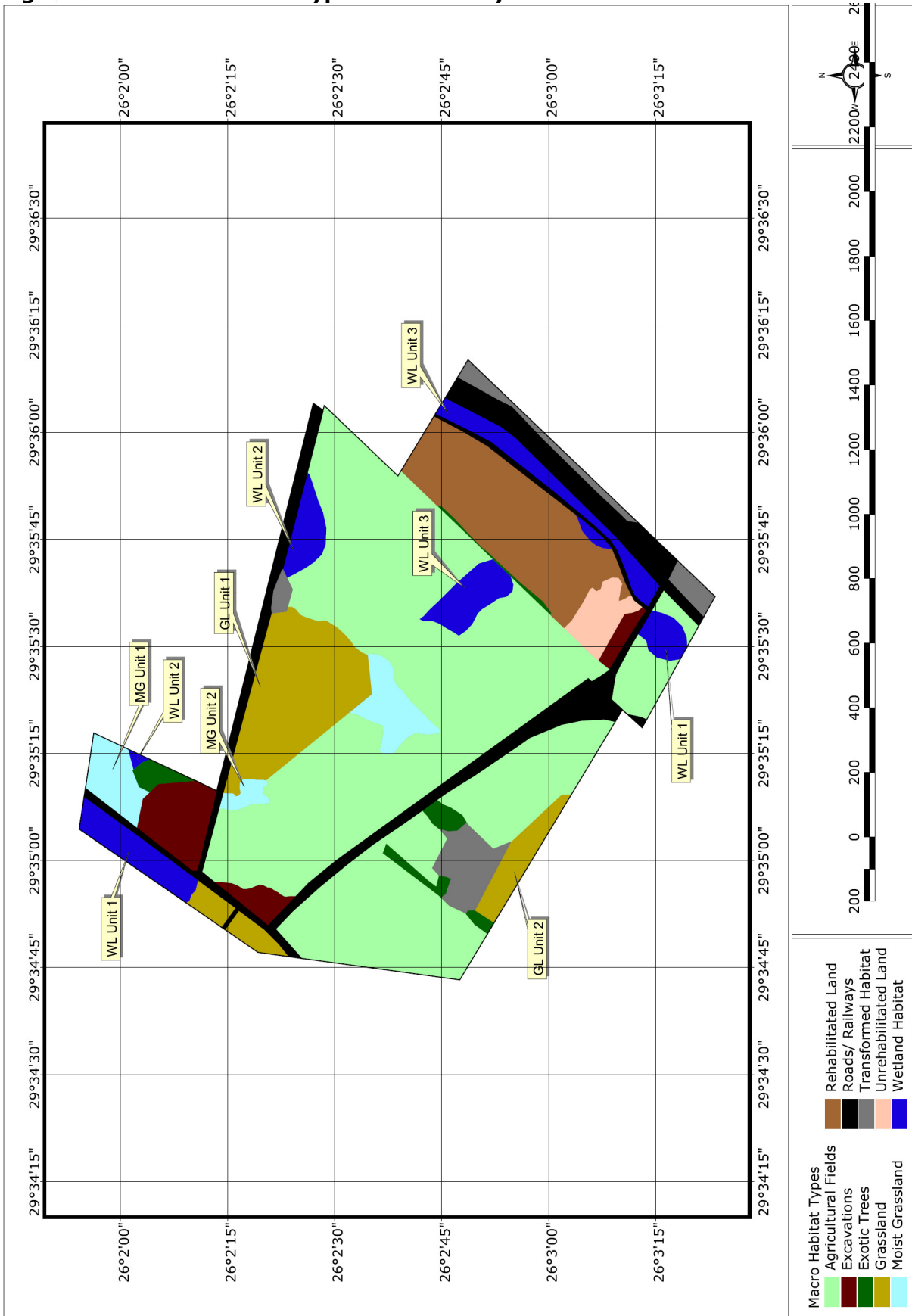
Floristic sensitivity calculations are presented in Table 7 and illustrated in Figure 7.

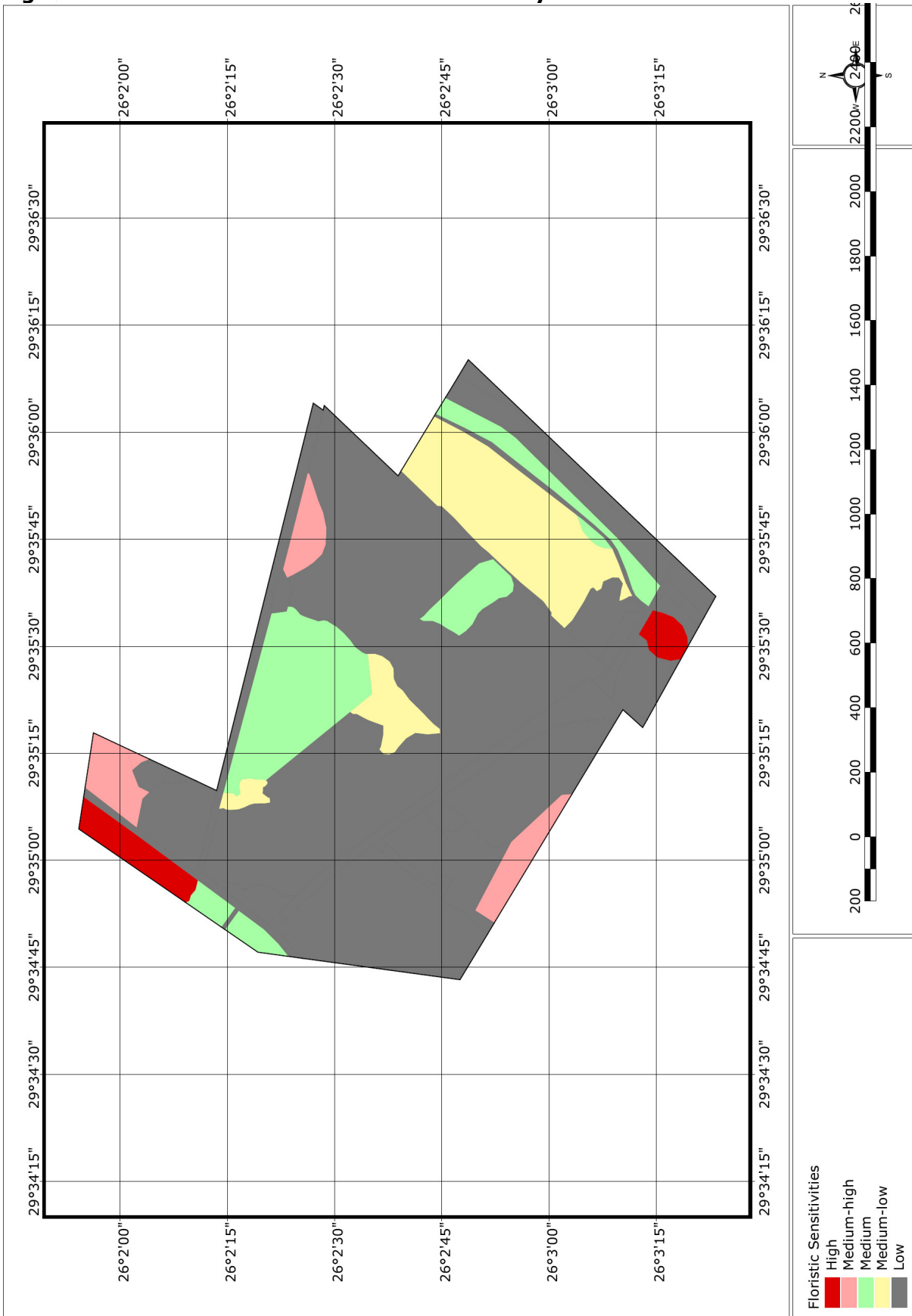| Table 2: Floristic sensitivity estimations for the respective habitat types								
Criteria	RD species	Landscape sensitivity	Status	Species diversity	Functionality/ fragmentation	TOTAL	SENSITIVITY INDEX	SENSITIVITY CLASS
Community	Criteria Ranking							
Agricultural Fields	1	0	1	2	2	32	10%	low
Excavations	0	0	0	0	0	0	0%	low
Exotic Trees	1	1	1	1	2	35	11%	low
Grassland – Unit 1	4	8	6	7	8	199	62%	medium-high
Grassland – Unit 2	3	6	2	6	7	141	44%	medium
Moist Grassland - Unit 1	6	7	5	6	6	194	61%	medium-high
Moist Grassland - Unit 2	1	6	1	2	2	80	25%	medium-low
Rehabilitated Land	1	2	2	3	4	65	20%	medium-low
Roads/ Railways	0	0	0	0	0	0	0%	low
Transformed Habitat	0	0	0	0	0	0	0%	low
Unrehabilitated Land	1	1	1	1	2	35	11%	low
Wetland Habitat - Unit 1	6	10	8	8	9	255	80%	high
Wetland Habitat - Unit 2	6	10	6	6	6	224	70%	medium-high
Wetland Habitat - Unit 3	3	5	4	4	6	132	41%	medium

The extent of habitat sensitivities within the respective alternatives is presented in Table 8.

Table 3: Extent of floristic habitat sensitivities within the study area		
Habitat Sensitivity	Extent	Percentage
High	8.9ha	2.6%
Medium-high	14.8ha	4.3%
Medium	41.4ha	12.0%
Medium-low	38.7ha	11.2%
Low	241.7ha	70.0%

Figure 2: Flora habitat sensitivities of the study area

Floristic Sensitivities

High
Medium-high
Medium
Medium-low
Low

B E C

Biodiversity Impact Assessment

Hendrina Ash Dam

F. S. I.

faunal specialists incorporated

8.9   DISCUSSION

The vegetation of the study area exhibits the expected signs of continued and long-term impacts resulting from agriculture, severe grazing pressure in the remaining parts of natural grassland and effects of indirect and direct mining and agricultural impacts on the wetland habitat. On a regional scale, these impacts are the main causes resulting in the Endangered status that is ascribed to the Eastern Highveld Grassland, of which only 55% remains of the original 1.27 million hectares. On a local scale, the level of impacts on the natural vegetation is regarded severe and irreversible and therefore any remaining parts of natural/ pristine vegetation should be regarded as highly sensitive and conserved at all costs.

Extremely little untransformed grassland remains in the study area, these portions are furthermore degraded due to severe and prolonged grazing pressure; to the extent that much of the flora species generally associated with this vegetation type, no longer occur, particularly forb and herb species. Wetland habitat types are similarly severely impacted due to, in particular, trampling and severe grazing pressure from cattle, but also from species changes that result from infestation from nearby agricultural fields, seeds that are imported by cattle droppings as well as poor quality water entering from nearby agricultural fields and mining areas.

The result of these long-term direct and indirect impacts is that only selected portions of the study area exhibit floristic characteristics of medium-high and high sensitivity. The location of areas of higher sensitivity categories are such that generic mitigation measures (exclusion) will likely result in preservation of these areas, although significant mitigation measures should be implemented in order to conserve/ improve the current status of these areas. For this purpose, the reader should refer to the wetland report. In the case of unavoidable impacts, it is recommended that a biodiversity offset programme be initiated that will target a nearby wetland/ endorheic pan. The details of such an offset programme (offset ratios, area identification and management options) should be addressed by the wetland ecologist.

Remaining portions of the study area are mostly low in floristic sensitivity and the loss of these areas is not expected to result in significant impacts on a local or regional scale. No species of conservation importance are likely to occur within these areas and no relocation is recommended for any plant species that might occur in the site.

9 FAUNA OF THE STUDY AREA

Please note that although the avifaunal component is addressed in a separate investigation, general comments to the presence of birds are made as it relates to biodiversity of the site and surroundings as well as to ascribed faunal sensitivities of parts of the study area.

9.1 REGIONAL FAUNAL DIVERSITY

Only specific faunal groups are used during the species-specific element of this faunal assessment because of restrictions concerning database availability. Data on the Q-degree level is available for the following faunal groups:

- Invertebrates: Butterflies (South African Butterfly Conservation Assessment – http://sabca.adu.org.za)
- Amphibians: Frogs (Atlas and Red Data Book of the South Africa, Lesotho and Swaziland)
- Reptiles: Snakes and other Reptiles (South African Reptile Conservation Assessment - http://sarca.adu.org.za)
- Mammals: Terrestrial Mammals (Red Data Book of the Mammals of South Africa: A Conservation Assessment.)

Animals known to be present in the Q-grid of the study area are considered potential inhabitants of the study area (all species known from the Mpumalanga Province were included to minimize the effect of sampling bias). The likelihood of each species' presence in the study areas was estimated based on known ecological requirements of species; these requirements were compared to the ecological conditions found in the study area and surrounding faunal habitat.

9.2 FAUNAL DIVERSITY OF THE SITE

A total of 30 animal species was recorded during the site investigation (refer Table 9) by means of visual sightings, tracts, faecal droppings, burrows and characteristic behaviour patterns. Signs of, or individuals of, four insects, one frog, twenty birds and five mammals were confirmed for the study area. None of the recorded species is currently considered to be under threat (IUCN Red Data, CITES or TOPS). This diversity of animals recorded in the study area are regarded typical of an area the size of the study site in this part of the Grassland Biome, given the mixture of habitat types present in the study area.

Table 4: Faunal species recorded in the study area				
Class	Order	Family	Biological Name	Colloquial Name
Insecta	Coleoptera	Coccinellidae	*Cheilomenes lunata*	Lunate Ladybird
	Lepidoptera	Nymphalidae	*Danaus chrysippus orientis*	African Monarch
			Vanessa cardui	Painted Lady
	Hymenoptera	Apidae	*Apis mellifera*	Honey Bee

Table 4: Faunal species recorded in the study area

Class	Order	Family	Biological Name	Colloquial Name
Amphibia	Anura	Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog
Aves	Galliformes	Numididae	*Numida meleagris*	Helmeted Guineafowl
		Phasianidae	*Pternistis swainsonii*	Swainson's Spurfowl
	Ciconiiformes	Threskiornithidae	*Bostrychia hagedash*	Hadeda Ibis
		Ardeidae	*Ardea cinerea*	Grey Heron
	Falconiformes	Accipitridae	*Elanus caeruleus*	Black-winged Kite
	Charadriiformes	Charadriidae	*Vanellus coronatus*	Crowned Lapwing
	Columbiformes	Columbidae	*Streptopelia capicola*	Ring-necked Dove
			Spilopelia senegalensis	Laughing Dove
	Strigiformes	Strigidae	*Asio capensis*	Marsh Owl
	Passeriformes	Laniidae	*Lanius collaris*	Common Fiscal
		Hirundinidae	*Cecropis cucullata*	Greater Striped Swallow
		Cisticolidae	*Cisticola tinniens*	Levaillant's Cisticola
			Cisticola cinnamomeus	Pale-crowned Cisticola
		Passeridae	*Passer melanurus*	Cape Sparrow
			Passer diffusus	Southern Grey-headed Sparrow
		Ploceidae	*Ploceus velatus*	Southern Masked Weaver
			Quelea quelea	Red-billed Quelea
		Estrildidae	*Estrilda astrild*	Common Waxbill
		Viduidae	*Vidua macroura*	Pin-tailed Whydah
		Motacillidae	*Macronyx capensis*	Cape Longclaw
Mammalia	Lagomorpha	Leporidae	*Lepus saxatilis*	Scrub Hare
	Rodentia	Muridae	*Tatera brantsii*	Highveld Gerbil
	Carnivora	Herpestidae	*Cynictis penicillata*	Yellow Mongoose
		Canidae	*Canis mesomelas*	Black-backed Jackal
	Artiodactyla	Bovidae	*Sylvicapra grimmia*	Common Duiker

In addition to species that were identified to species level, nine invertebrate families were recorded during the field investigation (refer Table 10).

Table 5: Invertebrate Families of the study area

Class	Order	Family	Colloquial Name
Insecta	Odonata	Coenagrionidae	Pond Damsels
		Libellulidae	Skimmers
	Dermaptera	Labiduridae	Long-horned Earwigs
	Orthoptera	Acrididae	Short-horned Grasshoppers
	Phasmatodea	Phasmatidae	Walking Sticks
	Coleoptera	Coccinellidae	Ladybirds
	Diptera	Tipulidae	Craneflies
		Muscidae	House Flies
		Calliphoridae	Bluebottles

Eighty-two Red Data animals are known to occur in the Mpumalanga Province (mammals, reptiles, amphibians and invertebrates) (refer Table 11). Of these 25 are listed as Data Deficient (DD), 28 as Near Threatened (NT), 20 as Vulnerable (VU), 7 as Endangered (EN) and 2 as Critically Endangered (CR). It is estimated that 79 of the 82 species have a low probability of occurring in the study area; two have a moderate-low probability and one species a high probability.

This Red Data Probability Assessment is based on:
• the size of the study area;
• the location of the study area within a largely untransformed environment; and
• the presence of relatively pristine habitat such as those associated with grassland, woodland, wetlands and outcrops.

Table 6: Red Data fauna assessment of the study area			
Biological Name	English Name	Status	Probability
Butterflies			
Aloeides barbarae	Barbara's Copper	Vulnerable	low
Aloeides nubilus	Cloud Copper	Vulnerable	low
Aloeides rossouwi	Rossouw's Copper	Endangered	low
Chrysoritis aureus	Golden Opal	Near Threatened	low
Chrysoritis phosphor	Scarce Scarlet	Vulnerable	low
Lepidochrysops jefferyi	Jeffery's Blue	Vulnerable	low
Lepidochrysops swanepoeli	Swanepoel's Blue	Vulnerable	low
Metisella meninx	Marsh Sylph	Vulnerable	high
Pseudonympha swanepoeli	Swanepoel's Brown	Vulnerable	low
Amphibians			
Breviceps sopranus	Whistling Rain Frog	Data Deficient	low
Hemisus guttatus	Spotted Shovel-nosed Frog	Vulnerable	low
Strongylopus wageri	Plain Stream Frog	Near Threatened	low
Reptiles			
Cordylus giganteus	Giant Girdled Lizard	Vulnerable	low
Homoroselaps dorsalis	Striped Harlequin Snake	Near Threatened	low
Kinixys natalensis	Natal Hinge-back Tortoise	Near Threatened	low
Lamprophis fuscus	Yellow-bellied House Snake	Near Threatened	low
Lamprophis swazicus	Swazi Rock Snake	Near Threatened	low
Tetradactylus breyeri	Breyer's Long-tailed Seps	Vulnerable	low
Mammals			
Acinonyx jubatus	Cheetah	Vulnerable	low
Amblysomus hottentotus	Hottentot's Golden Mole	Data Deficient	low
Amblysomus robustus	Robust Golden Mole	Endangered	low
Amblysomus septentrionalis	Higveld Golden Mole	Near Threatened	low
Atelerix frontalis	South African Hedgehog	Near Threatened	low
Canis adustus	Side-striped Jackal	Near Threatened	low
Cercopithecus mitis	Samango Monkey	Vulnerable	low
Cercopithecus mitis labiatus	Samango Monkey	Endangered	low
Chrysospalax villosus	Rough-haired Golden Mole	Critically Rare	low
Cloeotis percivali	Short-eared Trident Bat	Critically Rare	low
Crocidura cyanea	Reddish-grey Musk Shrew	Data Deficient	mod-low

Table 6: Red Data fauna assessment of the study area

Biological Name	English Name	Status	Probability
Crocidura flavescens	Greater Musk Shrew	Data Deficient	low
Crocidura fuscomurina	Tiny Musk Shrew	Data Deficient	low
Crocidura hirta	Lesser Red Musk Shrew	Data Deficient	low
Crocidura maquassiensis	Maquassie Musk Shrew	Vulnerable	low
Crocidura mariquensis	Swamp Musk Shrew	Data Deficient	low
Crocidura silacea	Lesser Grey-brown Musk Shrew	Data Deficient	low
Crocuta crocuta	Spotted Hyaena	Near Threatened	low
Damaliscus lunatus lunatus	Tsessebe	Endangered	low
Dasymys incomtus	Water Rat	Near Threatened	low
Diceros bicornis minor	Black Rhinoceros	Vulnerable	low
Elephantulus brachyrhynchus	Short-snouted Elephant-shrew	Data Deficient	low
Epomophorus gambianus	Gambian Epauletted Fruit Bat	Data Deficient	low
Grammomys dolichurus	Woodland Mouse	Data Deficient	low
Graphiurus platyops	Rock Dormouse	Data Deficient	low
Hipposideros caffer	Sundevall's Leaf-nosed Bat	Data Deficient	low
Hippotragus equinus	Roan Antelope	Vulnerable	low
Hippotragus niger niger	Sable Antelope	Vulnerable	low
Hyaena brunnea	Brown Hyaena	Near Threatened	low
Kerivoula lanosa	Lesser Woolly Bat	Near Threatened	low
Lemniscomys rosalia	Single-striped Mouse	Data Deficient	low
Leptailurus serval	Serval	Near Threatened	low
Lutra maculicollis	Spotted-necked Otter	Near Threatened	low
Lycaon pictus	African Wild Dog	Endangered	low
Manis temminckii	Pangolin	Vulnerable	low
Mellivora capensis	Honey Badger	Near Threatened	low
Miniopterus fraterculus	Lesser Long-fingered Bat	Near Threatened	low
Miniopterus schreibersii	Schreiber's Long-fingered Bat	Near Threatened	low
Myosorex cafer	Dark-footed Forest Shrew	Data Deficient	low
Myosorex varius	Forest Shrew	Data Deficient	mod-low
Myotis bocagei	Rufous Hairy Bat	Data Deficient	low
Myotis tricolor	Temminck's Hairy Bat	Near Threatened	low
Myotis welwitschii	Welwitsch's Hairy Bat	Near Threatened	low
Mystromys albicaudatus	White-tailed Rat	Endangered	low
Neamblysomus juliane	Juliana's Golden Mole	Vulnerable	low
Otomys slogetti	Sloggett's Rat	Data Deficient	low
Ourebia ourebi	Oribi	Endangered	low
Panthera leo	Lion	Vulnerable	low
Paracynictis selousi	Selous' Mongoose	Data Deficient	low
Pipistrellus anchietae	Anchieta's Pipistrelle	Near Threatened	low
Pipistrellus rusticus	Rusty Bat	Near Threatened	low
Poecilogale albinucha	African Weasel	Data Deficient	low
Raphicerus sharpei	Sharp's Grysbok	Near Threatened	low
Rhinolophus blasii	Peak-saddle Horseshoe Bat	Vulnerable	low
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	Near Threatened	low
Rhinolophus darlingi	Darling's Horseshoe Bat	Near Threatened	low
Rhinolophus fumigatus	Ruppel's Horseshoe Bat	Near Threatened	low
Rhinolophus hildebrantii	Hildebrant's Horseshoe Bat	Near Threatened	low
Rhinolophus landeri	Lander's Horseshoe Bat	Near Threatened	low
Rhynchogale melleri	Meller's Mongoose	Data Deficient	low
Suncus infinitesimus	Least Dwarf Shrew	Data Deficient	low
Suncus lixus	Greater Dwarf Shrew	Data Deficient	low
Suncus varilla	Lesser Dwarf Shrew	Data Deficient	low

Table 6: Red Data fauna assessment of the study area

Biological Name	English Name	Status	Probability
Tatera leucogaster	Bushveld Gerbil	Data Deficient	low

All of the animals recorded in the study area during the survey period (Tables 9 & 10) are commonly observed in the grasslands and wetlands of central Mpumalanga (pers. obs.). None of these animals indicates the presence of scarce or threatened faunal habitats of habitat characteristics within the study area, as they are generally associated with abundant habitat, such as that found in the study area. The faunal assemblages of the study area support the observation that the natural faunal habitats of the study area are degraded, fragmented and isolated. These observations are reflected in Table 11. Only three of the 82 Red Data species listed for Mpumalanga are not considered to have a low probability of occurring in the study area. This is a direct result of the poor status of the remaining habitat found in the study area (that is, for the species that are known from the general area in which the study area is located within Mpumalanga – within the Q-degree or Q-catchment).

Only one species is considered to have a high probability of occurring in the study area, namely the Marsh Sylph (*Metisella meninx,* Hesperiidae: Heteropterinae). This species is restricted to the wet vleis of highveld grassland in KZN, Mpumalanga, FS, Gauteng and the North West Province. The species is known to feed on *Leersia hexandra* (Poaceae – larval host) and is well represented in the wetlands of the general region in which the study area is located (pers. obs.).

9.4   FAUNAL HABITAT SENSITIVITY ASSESSMENT

During the field assessment, the study area was investigated and assessed in terms of the following biodiversity attributes (refer Table 12):

• Habitat status: level of habitat transformation and degradation vs. pristine faunal habitat;

• Habitat diversity: the number of different faunal habitat types (both on micro- and macro-scale) found within the proposed site and bordering areas;

• Habitat linkage: the degree to which the faunal habitat of the proposed site is linked to other natural areas enabling movement of animals to and from the habitat found on site;

• Red Data species: the degree to which suitable habitat for the red data species likely to be found in the study area (larger study area) is located on each site; and

• Sensitive faunal habitat: the relative presence of faunal sensitive habitat type elements such as surface rock associated with outcrops and hills as well as wetland elements.

In order to allow for a parallel comparison between floristic and faunal sensitivities, the floristic units are used as an indication of the faunal communities. Faunal sensitivities are illustrated in Figure 8.

Table 7: Faunal Habitat Sensitivities for the study area							
Community	Status	Diversity	Linkage	RD Likelihood	Habitat Sensitivity	Average	Sensitivity Class
Agricultural Fields	2	2	3	1	1	18%	low
Excavations	0	2	1	0	0	6%	low
Exotic Trees	2	3	1	2	1	18%	low
Grassland – Unit 1	3	3	4	3	4	34%	medium-low
Grassland – Unit 2	6	6	5	8	10	70%	medium-high
Moist Grassland - Unit 1	4	5	4	7	5	50%	medium
Moist Grassland - Unit 2	3	3	3	6	5	40%	medium
Rehabilitated Land	3	4	3	1	2	26%	medium-low
Roads/ Railways	0	0	0	0	0	0%	low
Transformed Habitat	1	2	2	1	0	12%	low
Unrehabilitated Land	0	1	1	0	0	4%	low
Wetland Habitat - Unit 1	8	7	8	8	10	82%	high
Wetland Habitat - Unit 2	4	6	5	8	10	66%	medium-high
Wetland Habitat - Unit 3	4	4	4	4	5	42%	medium

Figure 3: Faunal sensitivities of the study area

Faunal Sensitivities
High
Medium-high
Medium
Medium-low
Low
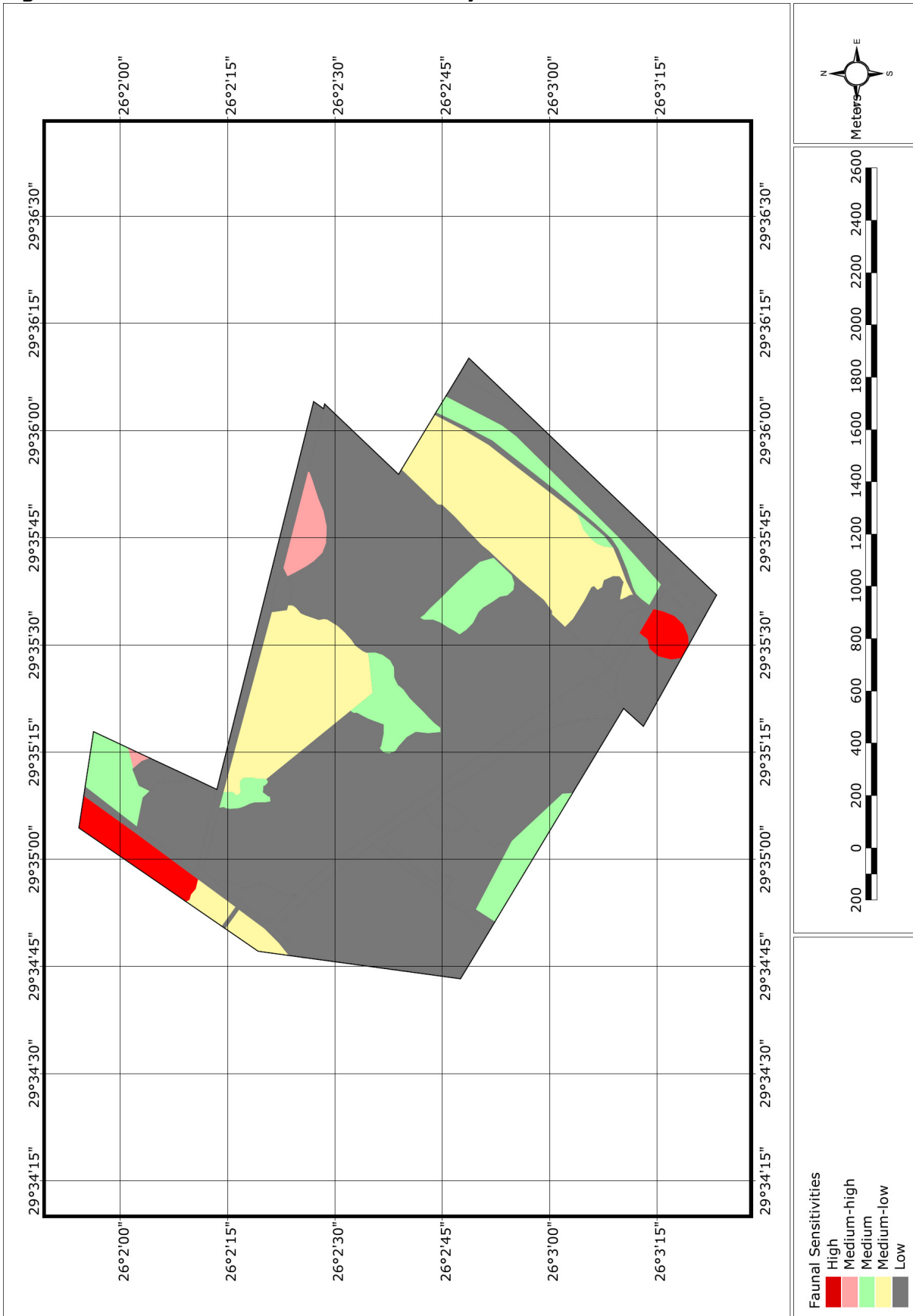
The study area is situated in an environment that comprehends extensive transformed faunal habitats because of crop agriculture and opencast coal mining. Similarly, the study area exhibits characteristics of severe transformation and degradation, comprising only small fragments of natural faunal habitat; most of these areas are wetland related with very little terrestrial faunal habitat remaining.

The faunal diversity of the study area that comprises 30 animal species and 9 invertebrate families are common to the region and none of these taxa is considered to be under any threat.

The only Red Data species listed for Mpumalanga that are considered to have a high probability of occurring in the study area is the Marsh Sylph (*Metisella meninx*). This species is commonly found in wetlands where the larval host plant, *Leersia hexandra*, abounds; as is the case within the wetlands of the study area.

None of the potential impacts associated with the proposed project for the Ash Dam at Site E, pipeline alternatives routes 1 and 2 and transmission line corridors 1 and 2 are considered high for any of the project phases – construction, operational or decommissioning (including cumulative impacts).

It is however strongly recommended that a biodiversity offset be considered for the unavoidable loss of the wetland habitat in the study area. The ecological management of a similarly sized wetland nearby could easily mitigate the loss of the wetland in the study area. Such an offset need not be extensive or costly; the proper ecological management of such a wetland can easily be done by employing ecological and biodiversity conservation principles.

Results of the respective floristic- and faunal habitat sensitivity assessments are interpreted to present an estimation (refer Table 13) that would reflect the expected impact of the construction and operation of the required infrastructure on the biological environment. While the estimations of habitat sensitivity, as presented in preceding chapters do provide an indication in terms of the extent and locality of important habitat, an interpretation of the surrounding habitat sensitivity is also implemented in these estimations.

Table 8: Ecological Sensitivity of the study area			
Community	Floristic Sensitivity	Faunal Sensitivity	Ecological Sensitivity
Agricultural Fields	low	low	**Low**
Excavations	low	low	**Low**
Exotic Trees	low	low	**Low**
Grassland – Unit 1	medium-high	medium-low	**Medium-high**
Grassland – Unit 2	medium	medium-high	**Medium-high**
Moist Grassland - Unit 1	medium-high	medium	**Medium-high**
Moist Grassland - Unit 2	medium-low	medium	**Medium-low**
Rehabilitated Land	medium-low	medium-low	**Medium-low**
Roads/ Railways	low	low	**Low**
Transformed Habitat	low	low	**Low**
Unrehabilitated Land	low	low	**Low**
Wetland Habitat - Unit 1	high	high	**High**
Wetland Habitat - Unit 2	medium-high	medium-high	**Medium-high**
Wetland Habitat - Unit 3	medium	medium	**Medium**

The extent of ecological sensitivities is illustrated in Figure 9. Estimated sensitivities reflect the separate floristic and faunal sensitivities and furthermore provide evidence of a highly degraded and transformed habitat that is characterised by the presence of mosaical remnants of natural habitat that are largely isolated.

The status of these portions generally also reflects the severity of current impacts resulting from the dominant land uses, including mining and agriculture (grazing and cultivation). While selected portions of habitat exhibit characteristics of medium-high and high ecological sensitivity, the remainder of the proposed site is regarded low in ecological sensitivity. The loss of these areas is not regarded significant on a local or regional scale. Remaining portions of higher sensitivity categories could effectively be protected by the implementation of generic mitigation measures. Whilst complete protection of these areas is not regarded possible, the implementation of a biodiversity offset programme, which should target surrounding areas of high biodiversity value, is regarded a suitable mitigation measure.

Results of the floristic and faunal investigations were interpreted holistically in order to assess the potential impact on the ecological environment. The impact assessment is aimed at presenting a description of the nature, extent significance and potential mitigation of identified impacts on the biological environment. These tabular assessments are presented in Section 12.3 in the form of an Impact Rating Matrix for relevant impacts within the development option or alternative.

11.1   IDENTIFICATION OF IMPACTS

No impacts were identified that could lead to a beneficial impact on the ecological environment of the study area since the proposed development is largely destructive as it involves the alteration of natural habitat or further degradation of habitat that is currently in a sub-climax status.

Impacts resulting from the proposed development on ecological attributes of the study area are largely restricted to the physical impacts on biota or the habitat in which they occur. Direct impacts include any impacts on populations of individual species of concern, including protected species, and on overall species richness. This includes impacts on genetic variability, population dynamics, overall species existence or health and on habitats important for species of concern. In addition, impacts on sensitive or protected habitat are included in this category, but only on a local scale. These impacts are mostly measurable and easy to assess, as the effects thereof is immediately visible and can be determined to an acceptable level of certainty.

In contrast, indirect impacts are not immediately evident and can consequently not be measured immediately. In addition, the extent of the effect is frequently large scale, mostly regional. A measure of estimation is therefore necessary in order to evaluate the importance of these impacts. Lastly, impacts of a cumulative nature places direct and indirect impacts of this projects into a regional and national context, particularly in view of similar or resultant developments and activities.

The following impacts are relevant to any type of development in a natural environment:
•   Direct impacts on threatened flora species;
•   Direct impacts on threatened fauna species;
•   Loss or degradation of natural/ pristine habitat;
•   Direct impacts on common fauna & interactions with structures & personnel;
•   Loss, or disruption of ecological connectivity;
•   Faunal interactions with structures, servitudes and personnel;
•   Loss/ degradation of surrounding habitat, species;
•   Impacts on SA's conservation obligations & targets; and
•   Increase in local and regional fragmentation/ isolation of habitat.

The following development alternatives are considered in the assessment:

- Proposed Ash Dam:
  - o   Alternative 1 – Site E;
  - o   Alternative 2 – No-Go Option;
- Proposed Transmission Lines:
  - o   Alternative Corridor 1;
  - o   Alternative Corridor 2;
  - o   Alternative 3 – No Go Option;
- Proposed Pipelines:
  - o   Alternative Route 1;
  - o   Alternative Route 2; and
  - o   Alternative 3 – No-Go Option.

Not all of the impacts are likely to occur; an assessment of the likelihood that respective impacts would occur is addressed in the following section. Based on this likelihood, the relevant impact is therefore omitted or included in the assessment section. Furthermore, not all impacts are likely to occur in all aspects of the proposed development. Impacts will therefore be included in a case-by-case scenario.

11.2   NATURE OF IMPACTS

11.2.1   *Direct Impacts on Threatened Flora Species*

This is a direct impact since it results in the physical damage or destruction of Red Data species or areas that are suitable for these species, representing a significant impact on the biodiversity of a region. Threatened plant species, in most cases, do not contribute significantly to the biodiversity of an area in terms of sheer numbers, as there are generally few of them, but a high ecological value is placed on the presence of such species in an area as they represent an indication of pristine habitat conditions. Conversely, the presence of pristine habitat conditions can frequently be accepted as an indication of the potential presence of species of conservation importance, particularly in moist habitat conditions.

Red Data species are particularly sensitive to changes in their environment, having adapted to a narrow range of specific habitat requirements. Changes in habitat conditions resulting from human activities is one of the greatest reasons for these species having a threatened status. Surface transformation/ degradation activities within habitat types that are occupied by flora species of conservation importance will ultimately result in significant impacts on these species and their population dynamics. Effects of this type of impact are usually permanent and recovery or mitigation is generally not perceived as possible.

One of the greatest limitations in terms of mitigating or preventing this particular impact, is that extremely little information is generally available in terms of the presence, distribution patterns, population dynamics and habitat requirements of Red Data flora species. To allow for